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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6: G11B 7/007, 20/10, 27/28		A2	(11) International Publication Number: WO 98/03973 (43) International Publication Date: 29 January 1998 (29.01.98)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
<p>(21) International Application Number: PCT/IB97/00867</p> <p>(22) International Filing Date: 14 July 1997 (14.07.97)</p> <p>(30) Priority Data: 96202110.1 24 July 1996 (24.07.96) EP (34) Countries for which the regional or international application was filed: NL et al.</p> <p>(71) Applicant: PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).</p> <p>(71) Applicant (for SE only): PHILIPS NORDEN AB [SE/SE]; Kottbygatan 7, Kista, S-164 85 Stockholm (SE).</p> <p>(72) Inventors: SPITZENBEGER, Uwe; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). FAESSEN, Louis, Marie, Hubertus; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).</p> <p>(74) Agent: FAESSEN, Louis, M., H.; Internationaal Octrooibureau B.V., P.O. Box 220, NL-5600 AE Eindhoven (NL).</p>		<p>(81) Designated States: CA, CN, JP, SG, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>Without international search report and to be republished upon receipt of that report.</i></p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
<p>(54) Title: IMPROVEMENTS IN AND RELATING TO OPTICALLY READABLE DISCS AND DISC RECORDING APPARATUS</p> <p>(57) Abstract</p> <p>An optical disc and an optical disc recording apparatus have been disclosed, which provide an improved protection against undesired or illegal copying. Information on optical discs is arranged in sectors, which each has an address label. The address value of the address labels increases linearly from the start of the disc or from the start of the program area of the disc. The address labels of specific sectors, which may have an informationless content, are given different, e.g. zero, address values, which prevent copying CD-ROM discs on a standard CD-Recorder apparatus. Said address labels may be stored in the main data stream or e.g. the subcode channel of a CD system.</p>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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<tr><td>000163</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000164</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000165</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000166</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000167</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000168</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000169</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000170</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000171</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000172</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000173</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000174</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> 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<tr><td>000199</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000200</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000201</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000202</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000203</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000204</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000205</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000206</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000207</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000208</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr><td>000209</td><td>1</td><td>0</td><td>0000</td><td>0000</td><td></td></tr> <tr</tbody></table>				Address	Sector	Blank	Data	Content	Comments	000000	1	0	0000	0000	Start of CD system Program	000001	1	0	0000	0000		000002	1	0	0000	0000		000003	1	0	0000	0000		000004	1	0	0000	0000		000005	1	0	0000	0000		000006	1	0	0000	0000		000007	1	0	0000	0000		000008	1	0	0000	0000		000009	1	0	0000	0000		000010	1	0	0000	0000		000011	1	0	0000	0000		000012	1	0	0000	0000		000013	1	0	0000	0000		000014	1	0	0000	0000		000015	1	0	0000	0000		000016	1	1	0000	0000	Program Address	000017	1	1	0000	0000	Program Address	000018	1	1	0000	0000	No reference to other address	000019	1	0	0000	0000	In the directory of the CD-ROM	000020	1	1	0000	0000		000021	1	1	0000	0000		000022	1	1	0000	0000		000023	1	1	0000	0000		000024	1	1	0000	0000		000025	1	1	0000	0000		000026	1	1	0000	0000		000027	1	1	0000	0000	Address 000027 reading	000028	1	1	0000	0000	Address 000028 reading	000029	1	1	0000	0000	Address 000029 reading	000030	1	1	0000	0000		000031	1	1	0000	0000		000032	1	1	0000	0000		000033	1	0	0000	0000		000034	1	0	0000	0000		000035	1	0	0000	0000		000036	1	0	0000	0000		000037	1	0	0000	0000		000038	1	0	0000	0000		000039	1	0	0000	0000		000040	1	0	0000	0000		000041	1	0	0000	0000		000042	1	0	0000	0000		000043	1	0	0000	0000		000044	1	0	0000	0000		000045	1	0	0000	0000		000046	1	0	0000	0000		000047	1	0	0000	0000		000048	1	0	0000	0000		000049	1	0	0000	0000		000050	1	0	0000	0000		000051	1	0	0000	0000		000052	1	0	0000	0000		000053	1	0	0000	0000		000054	1	0	0000	0000		000055	1	0	0000	0000		000056	1	0	0000	0000		000057	1	0	0000	0000		000058	1	0	0000	0000		000059	1	0	0000	0000		000060	1	0	0000	0000		000061	1	0	0000	0000		000062	1	0	0000	0000		000063	1	0	0000	0000		000064	1	0	0000	0000		000065	1	0	0000	0000		000066	1	0	0000	0000		000067	1	0	0000	0000		000068	1	0	0000	0000		000069	1	0	0000	0000		000070	1	0	0000	0000		000071	1	0	0000	0000		000072	1	0	0000	0000		000073	1	0	0000	0000		000074	1	0	0000	0000		000075	1	0	0000	0000		000076	1	0	0000	0000		000077	1	0	0000	0000		000078	1	0	0000	0000		000079	1	0	0000	0000		000080	1	0	0000	0000		000081	1	0	0000	0000		000082	1	0	0000	0000		000083	1	0	0000	0000		000084	1	0	0000	0000		000085	1	0	0000	0000		000086	1	0	0000	0000		000087	1	0	0000	0000		000088	1	0	0000	0000		000089	1	0	0000	0000		000090	1	0	0000	0000		000091	1	0	0000	0000		000092	1	0	0000	0000		000093	1	0	0000	0000		000094	1	0	0000	0000		000095	1	0	0000	0000		000096	1	0	0000	0000		000097	1	0	0000	0000		000098	1	0	0000	0000		000099	1	0	0000	0000		000100	1	0	0000	0000		000101	1	0	0000	0000		000102	1	0	0000	0000		000103	1	0	0000	0000		000104	1	0	0000	0000		000105	1	0	0000	0000		000106	1	0	0000	0000		000107	1	0	0000	0000		000108	1	0	0000	0000		000109	1	0	0000	0000		000110	1	0	0000	0000		000111	1	0	0000	0000		000112	1	0	0000	0000		000113	1	0	0000	0000		000114	1	0	0000	0000		000115	1	0	0000	0000		000116	1	0	0000	0000		000117	1	0	0000	0000		000118	1	0	0000	0000		000119	1	0	0000	0000		000120	1	0	0000	0000		000121	1	0	0000	0000		000122	1	0	0000	0000		000123	1	0	0000	0000		000124	1	0	0000	0000		000125	1	0	0000	0000		000126	1	0	0000	0000		000127	1	0	0000	0000		000128	1	0	0000	0000		000129	1	0	0000	0000		000130	1	0	0000	0000		000131	1	0	0000	0000		000132	1	0	0000	0000		000133	1	0	0000	0000		000134	1	0	0000	0000		000135	1	0	0000	0000		000136	1	0	0000	0000		000137	1	0	0000	0000		000138	1	0	0000	0000		000139	1	0	0000	0000		000140	1	0	0000	0000		000141	1	0	0000	0000		000142	1	0	0000	0000		000143	1	0	0000	0000		000144	1	0	0000	0000		000145	1	0	0000	0000		000146	1	0	0000	0000		000147	1	0	0000	0000		000148	1	0	0000	0000		000149	1	0	0000	0000		000150	1	0	0000	0000		000151	1	0	0000	0000		000152	1	0	0000	0000		000153	1	0	0000	0000		000154	1	0	0000	0000		000155	1	0	0000	0000		000156	1	0	0000	0000		000157	1	0	0000	0000		000158	1	0	0000	0000		000159	1	0	0000	0000		000160	1	0	0000	0000		000161	1	0	0000	0000		000162	1	0	0000	0000		000163	1	0	0000	0000		000164	1	0	0000	0000		000165	1	0	0000	0000		000166	1	0	0000	0000		000167	1	0	0000	0000		000168	1	0	0000	0000		000169	1	0	0000	0000		000170	1	0	0000	0000		000171	1	0	0000	0000		000172	1	0	0000	0000		000173	1	0	0000	0000		000174	1	0	0000	0000		000175	1	0	0000	0000		000176	1	0	0000	0000		000177	1	0	0000	0000		000178	1	0	0000	0000		000179	1	0	0000	0000		000180	1	0	0000	0000		000181	1	0	0000	0000		000182	1	0	0000	0000		000183	1	0	0000	0000		000184	1	0	0000	0000		000185	1	0	0000	0000		000186	1	0	0000	0000		000187	1	0	0000	0000		000188	1	0	0000	0000		000189	1	0	0000	0000		000190	1	0	0000	0000		000191	1	0	0000	0000		000192	1	0	0000	0000		000193	1	0	0000	0000		000194	1	0	0000	0000		000195	1	0	0000	0000		000196	1	0	0000	0000		000197	1	0	0000	0000		000198	1	0	0000	0000		000199	1	0	0000	0000		000200	1	0	0000	0000		000201	1	0	0000	0000		000202	1	0	0000	0000		000203	1	0	0000	0000		000204	1	0	0000	0000		000205	1	0	0000	0000		000206	1	0	0000	0000		000207	1	0	0000	0000		000208	1	0	0000	0000		000209	1	0	0000	0000	
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Improvements in and relating to optically readable discs and disc recording apparatus.

The invention relates to disc recording apparatus for recording digital data on an optically readable disc. The invention further relates to optically readable discs on which such digital data have been recorded, and playback apparatus for such discs.

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A system using an optically readable digital audio disc (referred to as a compact disc) is a disc system which can reproduce high quality stereophonic musical sounds. Such system is known from the International Standard IEC 908: "Compact Disc Digital Audio System". Digital data such as data representative of characters, display data, 10 program software, computer data, images, etc. other than stereophonic musical sounds can be stored on and reproduced by such a disc system without markedly modifying the arrangement of the player for such disc. A playback apparatus for reproducing visual information such as charts and statistics using graphics, pictorial illustration using still pictures, and a video game apparatus by adding a display unit, have been realized thereby 15 providing a wide range of use for a compact disc system. The data memory capacity of the current compact disc is about 640 Mbytes, and therefore, a compact disc has a very large advantage as compared with the memory capacity of a standard flexible disc. Such CD systems are known as the CD-ROM system and are known amongst others form the ECMA standard - 130 and 168 respectively: "Data Interchange on Read Only 120mm Optical Data 20 Disks (CD-ROM)" and "Volume and File Structure of Read only and Write Once Compact Disc Media for Information Exchange" respectively.

A drawback of the optically readable discs is that they can be copied easily. Although there is a copy protect bit used in each group of frames of a CD-Audio disc in the subcode channel, still undesired copying is possible, because this bit has a fixed 25 repetitive position in the bitstream provided by the output of the decoder in a CD-player, and thus can easily be "overruled". Further, software programs for PC applications etc. are distributed by use of CD-ROM discs in vast amounts. Here again it is highly desirable that copying can not be done without permission/authorization. Also a lot of other formats of optically readable discs are gaining commercial interest and thus anti-copy measures areg

highly desirable.

It is an object of the invention to provide an optically readable disc, which
5 has an improved protection against undesired or illegal copying by use of an optical disc
recording apparatus. It is a further object of the invention to provide an optically readable
disc for any type of compact disc system, which has an improved protection against
undesired and or illegal copying of such discs by use of CD-recording apparatus, which are
already available in the market.

10 It is another object of the invention to provide an optical disc recording
apparatus, which has an improved capability to prevent undesired and or illegal copying of
optically readable discs in addition to the todays anti copy mechanisms.

According to a first aspect of the invention there is provided an optically
readable disc comprising digital data being arranged in sectors corresponding to a unit of
15 organisation of the digital data and each sector being accessible via an address label stored
with said sector, characterized in that the address label has an address value increasing with
each successive sector except for at least one address label, which has a address value
different from the increasing address value. This has the advantage, that such address values
cannot be created using a standard optical recording apparatus.

20 A preferred embodiment of the optically readable disc, wherein the digital
data comprises digital mainstream data and digital subcode data, is characterized in that the
address label having said different address value is stored in the digital subcode data. This is
advantageous in that the subcode data cannot be controlled directly on a recording apparatus.

A further embodiment of the optically readable disc is characterized in
25 that the address label having said different address value is stored with a sector containing
informationless data. This has the advantage, that no special reading device is needed for
reading the sectors having the different address values.

A further embodiment of the optically readable disc is characterized in
that said different address value is a zero address value.

30 A further embodiment of the optically readable disc is characterized in
that a multiple of successive address labels have said different address value.

A further embodiment of the optically readable disc, wherein the sectors
are arranged in a program area starting with a pregap comprising sectors with
informationless data, is characterized in that at least one address label having said different

address value, is arranged in the pregap.

A further embodiment of the optically readable disc, wherein the sectors are arranged in a program area preceded by lead-in area and succeeded by a lead-out area, is characterized in that at least one address label having said different address value is arranged 5 in the lead-in area and/or the lead-out area.

A further embodiment of the optically readable disc is characterized in that at least one address label which has said different address value is arranged preceding or succeeding a sector storing copy-protectable information.

A further embodiment of the optically readable disc, on which the digital 10 data is stored according to predetermined modulation and error correction rules, is characterized in that at least one sector comprises at least one error effected by violating the predetermined modulation and error correction rules.

According to a second aspect of the invention there is provided an optical disc recording apparatus for recording digital data on an optically readable disc, the digital 15 data being arranged in sectors and each sector being addressable via an address label, which address label has an address value increasing with each successive sector, characterized in that the optical disc recording device comprises reading means for reading address labels, detection means for detection of an address label, which has a address value different from the increasing address value relative to the address value of the preceding address label, and 20 abortion means for aborting the recording of digital data upon detection of said address label, which has said different address value.

According to a third aspect of the invention there is provided an optical disc playback apparatus for retrieving digital data from an optically readable disc, the digital data being arranged in sectors and each sector being addressable via an address label, 25 characterized in that the optical disc playback device comprises verification means for verifying an address label, which has an address value different from the address value increasing relative to the address value of the preceding address label, and abortion means for aborting the playback of digital data in dependence upon the verification.

30

The invention will be illustrated, by way of an example, with reference to the drawings, in which

Figures 1 and 2 are schematic diagrams which are used to describe the data arrangements of the recorded data of a compact disc to which this invention is applied;

Figure 3 is a schematic diagram showing the arrangement of one block of the digital main data in one embodiment of this invention;

Figure 4 is a block diagram of apparatus in accordance with this invention;

5 Figure 5 is a schematic diagram showing a word format of serial data produced in this apparatus;

Figure 6 shows a schematic diagram of the layout of a CD-ROM disc as a function of time;

10 Figure 7 shows in a matrix a schematic diagram a table of addresses, sector numbers, tracks and content of CD-ROM disc as a function of time in accordance with the invention;

Figure 8 shows a schematic diagram of the layout of the sector organisation of another optical disc; and

15 Figure 9 shows schematically an optical disc recording apparatus in accordance with the invention.

Figure 1 shows the data stream recorded on a compact disc. One frame Fr consists of 588 bits of recorded data, and each frame has at its head a frame sync pulse FS 20 of a specific bit pattern. The frame sync pulse FS is followed by a 3-bit DC-restriction word RB. Thereafter, the 0th - 32nd data words DB each having 14 bits and the 3-bit DC-restriction words RB are further recorded alternately. The 0th words among these data words DB are subcode data (or so-called user bytes) of a subcode signal which is used to control the playback of a disc and to display the relating information or the like. In the audio 25 disc format, the 1st to 12th and 17th to 28th data words DB are assigned for audio data in the main channel. The remaining 13th to 16th and 29th to 32nd data words DB are assigned for parity data of the error correction code in the main channel. Each of the data words DB consists of 14 bits into which 8-bit data has been converted by a 8 to 14 conversion upon recording.

30 Figure 2 shows the state of data in one group of the frames (98 frames), with the 98 frames arranged sequentially in parallel. In Figure 2, each of the data words D3 is represented by 8 bits and the DC-restriction words RB are excluded. The subcode signal data P to W in the 0th and 1st frames form the sync patterns which are predetermined bit patterns. For the Q channel, the CRC codes for error detection are inserted in the latter 16

frames among the 98 frames.

The P-channel signal is a flag to indicate a music program and a pause. With music recorded in audio disc format, this signal in the P-channel has a lower level throughout the duration of a music program and a higher level throughout the duration of a pause, and has pulses of 2-Hz period in the lead-out section. It is possible to select and play back the specified music program by detecting and counting this signal in the P channel. The Q channel enables more complicated control of this type. For example, when the Q-channel information is stored in a microcomputer in the disc playback apparatus, it is possible to shift quickly from one music program to another during the playback of a music program; thus, 10 respective ones of the recorded music programs may be selected at random. The other R through W channels can be used to indicate an author or composer, an explanation, poetry, or the like for the music programs recorded on the disc.

Among the 98 bits in the Q channel, the first two bits are used for a sync pattern; the next four bits for control bits; then the next four bits for address bits; the following 72 bits for data bits; and at last a CRC code for error detection is added. A track number code TNR and an index code X are included in 72 bits representative of the data bits. The track number code TNR can be varied from 00 to 99, and the index code X can be likewise changed from 00 to 99.

Furthermore, the data in the Q channel contains a time indication code representative of the time durations of music programs and pauses, and a time indication code indicative of an absolute time duration that continuously changes from the beginning to the end on the most outer rim side in the program area of the compact disc. These time indications codes comprise the codes indicating minute, second and frame which each consist of two digits. One second is divided into 75 frames. In order to access digital data from the compact disc on a shorter unit basis than a music unit, the time indication code with respect to the above-mentioned absolute time duration is used in this embodiment of the present invention.

Figure 3 illustrates an arrangement of digital signals other than stereophonic musical signals from the compact disc in an embodiment of the present invention. As described above, the subcode signal for a compact disc is organised in units of 98 frames. In this embodiment of Figure 3, one block of the main data is constituted by the length of 98 frames corresponding to the same group of the 0th to 97th frames. In the audio disc format, one frame includes the digital audio data consisting of 12 words each of 16 bits,

and so 24-byte digital main data can be inserted in one frame. Referring to Figure 3, one row contains total 32 bits of one sample in the L channel of the audio data and one sample in the R channel thereof, and each frame consists of six such rows.

In the embodiment of Figure 3, a one-bit sync bit is added to the head of
5 each 32-bit row of the block. In the 0th frame F₀ the sync bits at the respective heads of the first 32 bits and the next 32 bits are zero. The sync bits in each head of the respective first 32 bits in the frames bearing even numbers except the 0th frame are zero, while the sync bits in each head of the respective first 32 bits in the frames bearing odd numbers are one. These sync bits enable the detection of the head location of the block on a 98-frame unit basis.

10 The above-mentioned one block consists of (24 bytes × 98 = 2352 bytes). The data of 2 Kbytes (2048 bytes) is inserted in one block, and 304 bytes (2432 bits) remain. (6 × 98 = 588 bits) are used as sync bits. A 7-bit mode signal and a 24-bit address signal are inserted in the first 32 bits in the 0th frame, so that 1813
15 bits still remain in one block. These 1813 bits can be assigned to redundant bits when the error correction coding processing is performed for the data of one block.

The mode signal serves to specify the kind of data in that block. For example, the mode signal is used to discriminate character data, still picture data and program code. The address signal serves to specify the data in the block. Furthermore, the reason why the sync bits of the frame bearing even numbers are set to zero is that the
20 present embodiment of the invention takes account of an arrangement of data block on a two-frame unit basis. For the block having a size of two frames, a mode signal and an address signal are added to each block. In the case of the block having a length of 98 frames as in the Figure 3 embodiment of this invention, the codes for indicating the P data and the absolute time durations of the Q data in the subcode signals in the same
25 block are identical.

The digital signals in the block format shown in Figure 3 can be recorded on a compact disc in the same manner as an audio compact disc. That is, a digital signal to be recorded is supplied to a digital input terminal of a digital audio processor and this digital signal is converted into a video signal format, thereby recording it using a VTR system of
30 the rotary head type. In this case, TOC (table of contents) data to generate a subcode signal is preliminarily recorded in the audio track in the starting edge section on a magnetic tape on which this digital signal will be recorded. Next, the TOC data reproduced from this magnetic tape is supplied to a subcoding generator, and the reproduced digital signal is supplied to an encoder, and the subcode signal is further supplied to this encoder, then a laser beam is

modulated on the basis of an output of the encoder. A master disc is made by means of this modulated laser beam.

As another method of recording a digital signal, the data stored on, for example, a hard disc memory that can be accessed at a high speed is accessed by a 5 minicomputer, and a digital signal is supplied in real time to an encoder of a cutting system.

Figure 4 shows a playback apparatus in accordance with this invention. In Figure 4, reference numeral 1 denotes a compact disc on which a digital signal of the above-described format has been spirally recorded. The compact disc 1 is rotated by a spindle motor 2. In this case, the spindle motor 2 is controlled by a spindle servo circuit 3 so 10 that the compact disc 1 rotates at a constant linear velocity.

Reference numeral 4 indicates an optical head, which has a laser source for generating a laser beam for pickup, a beam splitter, an optical system such as an objective lens or the like, and a photoreceptive device for receiving the reflected laser beam from the compact disc 1, etc. The optical head 4 can be moved in the radial direction of the 15 compact disc 1 by the thread feed motor 5. The thread feed motor 5 is driven by a thread drive circuit 6. The optical head 4 can be deflected both in the direction perpendicular to the signal surface of the compact disc 1 and in the direction parallel thereto, and it is controlled so that the focusing and tracking of the laser beam upon playback are always properly performed. For this purpose, a focusing and tracking servo circuit 7 is provided.

20 A reproduction signal from the optical head 4 is supplied to an RF amplifier 8. The optical head 4 is provided with a focus error detecting section consisting of a combination of, for example, cylindrical lens and 4-dividing detector, and a tracking error detecting section using three laser spots. This servo error signal is supplied to a focusing and tracking servo circuit 7. An output signal of the RF amplifier 8 is supplied to a digital 25 demodulator 9 and a bit clock reproduction circuit 10. The digital signal recorded on the compact disc 1 has been EFM modulated. The EFM modulation is a method of block-converting 8-bit data into a preferable 14-bit (i.e. 14 bits such as to provide a long minimum inverting time period of the modulated signal and reduce its low-frequency component) pattern. The digital demodulator 9 is constituted in such a manner as to carry out 30 the demodulation of EFM. The bit clock fetched by a bit clock reproduction circuit 10 is supplied to the digital demodulator 9 and the spindle servo circuit 3.

The subcode signal is separated by the digital demodulator 9 and this separated subcode signal is supplied to a system controller 11. The system controller 11 is equipped with a CPU, and the rotating operation of the compact disc 1, the thread feeding

operation, the reading operation of the optical head 4, or the like are controlled by the system controller 11. Control commands are supplied to the system controller 11 through an interface 17, that will be described later. Namely, the reading operation of a desired digital signal from the compact disc 1 using the subcode signal is controlled by the system controller 5 11.

The main digital data output from the digital demodulator 9 is supplied through a RAM controller 12 to RAM 13 and an error correction circuit 14. The processing with respect to the elimination of variation of the time base, error correction and error interpolation are carried out by the RAM controller 12, RAM 13 and error correction circuit 10 14, so that the digital main data is fetched from terminals 15L and 15R. In the case of playback of a compact disc on which only audio data has been recorded, D/A converters would be connected to these terminals 15L and 15R, respectively. In the case of Figure 4, no D/A converter is provided to fetch the digital data from the outputs, and the reproduced digital data is supplied to a data converter 16. The reproduced subcode signal is also supplied 15 to this data converter 16, and the reproduced data is converted into the form of a serial signal.

This serial signal is supplied to the interface 17, and the data for the system controller 11 is supplied from a microcomputer system 18 through the interface 17 to the controller 11. The microcomputer system 18 specifies a readout address and applies 20 control signals such as start signals in addition to this readout address to the interface 17 and system controller 11. A list of a plurality of record areas has been recorded in the lead-in track in the most inner rim section on the compact disc 1 using the subcode signal as addresses. This list is reproduced in the initial state to start the readout of the compact disc 1 and is read by the microcomputer system 18.

Figure 5 shows an example of the word format of the serial signal output 25 from the data converter 16. For this serial signal, one word consists of 32 bits; the first four bits are for preamble; next four bits for auxiliary bits of the audio data; and next 20 bits for digital audio sample. In the case where the digital audio sample consists of 16 bits, 16 bits from the least significant bit (LS8) are inserted. Four bits are added after the digital audio 30 sample. Among these four bits, the first bit indicated by V is a flag to show whether the digital audio sample of that word is effective or not; bit U is each bit of the subcode signal; bit C is a bit to identify the channel; and bit P is a parity bit. This bit U of the subcode signal is inserted into each word format one bit by one and these inserted bits are sequentially transmitted.

In one embodiment of the present invention, a read instruction to a predetermined address is first executed by the microcomputer system 18. This address is a code itself for indicating an absolute time duration in the Q channel and is supplied through an interface 17 to the system controller 11. The system controller 11 controls the thread 5 drive circuit 6 to move the optical head 4 to the location near a desired pickup location while supervising the subcode signal reproduced by the optical head 4. In this example, therefore, the reproduction is started from the location spaced a few blocks apart to prevent a malfunction due to the access operation being not finished if an error occurred in the reproduced subcode signal and the set subcode signal is not reproduced. The desired block is 10 caught by detecting the coincidence of the reproduced subcode signal with the designated address, or by starting the playback from the location near the correct subcode signal and then counting the frame sync signals.

In fig. 6 a schematic layout of a CD-ROM disc in accordance with the invention has been shown. Reference is made herewith to the ECMA-Standard 130 (CD-ROM-Standard) Section IV: Recording, which is incorporated in here for purpose of reference.

The information area IA on a disc comprises at least a lead-in area LI, a program area PG and a lead-out area LO. The track number TNO, which is recorded in the Q-channel of the subcode channel, has the value OO and AA respectively for the lead-in area 20 LI and the lead-out area LO respectively.

The program area PG has been divided in a plurality of tracks. In this example the CD-ROM disc comprises CD-Audio tracks as well as CD-ROM data tracks. The four tracks as shown have the successive track numbers, 01, 02, 03 and 04 and are an audio track, a ROM track, a ROM track and an Audio track respectively. The index belonging to 25 track number TNO, each time has the value 00 during a pregap, which comprises informationless data e.g. the value 00 (in Hexadecimal notation). The index has the value 01 during the groups of frames (sectors) comprising information such as audio or ROM DATA.

In the subcode data time references have been recorded. A first time reference TIME relates to the information in the track. Each time at the start of the 30 information in a track the time reference TIME starts at a value zero and increases linearly with the successive groups of frames in a track. Further the time reference TIME starts at a certain value at the start of a pregap and decreases linearly with the successive groups of frames, which comprise informationless data (e.g. "digital silence"), and ends at the value zero at the end of the pregap.

Further an absolute time code ATIME has been recorded in the Q channel of the subcode data. This absolute time code ATIME has a zero value at the beginning of the program area PG and increases linearly with the groups of frames in the program area PG.

In accordance with a first embodiment of the invention in the pregap 1 there have been

- 5 recorded absolute time codes that do not comply with the linear increasing values of ATIME, e.g. the value zero can be recorded as indicated by zero sector address ZSA1.

The ROM data in the CD-ROM tracks (TNO = 02 or TNO = 03) are accessible by address labels that have been recorded in the main stream data. These ROM-Sector Header Addresses have the same value as the absolute time code ATIME in the Q

- 10 channel corresponding to the same sectors (groups of frames) as shown in figure 6. In another embodiment of the invention certain ROM Sector Header Addresses have been set to zero beyond pregap 2, TNO = 02; INDEX = 01. Again this is a violation of the linearly increasing absolute time code ATIME and the ROM Sector Heading Addresses corresponding therewith.

- 15 In fig. 7 a table of sector addresses ADD, sector numbers SN, track numbers TNO, index numbers INDEX and content has been shown. The sector address 00:00:00 first occurring in the very first address of the Program Area PG (see Fig. 6). The sector addresses ADD increases linearly during the 150 sector of the pregap. (from 00:00:00 to 00:00:74 for the first 75 sectors and from 00:01:00 to 00:01:74 for the second 75 sectors).

- 20 The first part of the CD-ROM track 1 comprises sectors, which may comprise information start at sector SN=0 at address 00:02:00. In accordance with the invention sectors 27, 28 and 29 each have an address ADD equal to 00:00:00, which violates the linear increasing sequence of addresses. The content of the sectors 27, 28, 29 are informationless. These sectors 27, 28 and 29 have been preceded by sectors that do have information, e.g. sectors

- 25 16 and 17 contain the Primary Volume descriptor for this CD-ROM discs. The sectors SN = 18 to SN = 74 do not have information and are not referred to in the directory of the CD-ROM. Sector SN = 75 and succeeding sectors up to 355.349 provide the CD-ROM user data, which end at the postgap of sectors 355.350 to 355.499. The next sector is the start of the lead-out area, which is shown by track number TNO = AA.

- 30 In fig. 8 another embodiment of a layout of an optically readable disc in accordance with the invention has been shown. The disc shows an information area, a lead-in area and a lead-out area. The lead-in area comprises several blocks, each comprising the same number of sectors (e.g. a block comprises 16 sectors). A number of Start Blocks SB all comprise informationless data. Reference code blocks RB may comprise information for

error correction of the Start Blocks SB. Intermediate Blocks IB1 again may comprise informationless data. In a next part of the Lead-In Area several control blocks CB are present, which may comprise information about the disc, discmanufacturer etc. Intermediate Blocks IB2 follow the Control Blocks CB, precede the Data Area DA and comprise

5 informationless sectors. Sector number addresses start with address SN = 0 at start of the lead-in area and end with address SN = n for the last sector of the lead-out area. The sector addresses increase linearly from 0 to n for each sector therebetween, except for a few sectors in e.g. intermediate blocks IB1 or IB 2. These few sectors have sector address labels, which have an address value different from the increasing value, e.g. a zero address value. As a

10 result undesired copying is prevented.

It should be emphasized that the sector addresses, which should violate the linear increasing sequence of the address values can be arranged at random in the specified areas, so as to increase the threshold of undesired/illegal copying of discs.

Fig. 9 by way of example shows an embodiment of an information recording device in accordance with the invention. The present embodiment is a recording device by means of which information can be recorded on a record carrier 91, for example an optical record carrier, which is rotated about an axis 92. The information recording device comprises a customary read/write head 93, arranged opposite the rotating record carrier 91. By means of a customary positioning system for example in the form of a motor 94 and a spindle 95a, the read-write head 93 can be moved in a radial direction relative to the record carrier 91 under control of a customary control unit 95, which comprises for example a microprocessor.

An information signal Vi to be recorded can be applied to a signal processing circuit 97 via an input 96. The signal processing circuit 97 is of a customary type, 25 which converts the applied input signal into a recording signal Vop is applied to a driver circuit 98 of a customary type, which converts the recording signal Vop into a drive signal Vs for the read/write head 93 in such a way that an information pattern corresponding to the recording signal Vop is recorded on the record carrier. For the purpose of reading the recorded information patterns the read/write head 93 has an output for supplying a read signal V1 which is representative of the information pattern being read. The read signal V1 is applied to a read circuit 99 for recovering the information presented by the read signal V1. The driver circuit 98 is of an adjustable type, enabling one or more of the parameters with which the quality of the recorded information pattern can be influenced to be adjusted. When an optical read/write head is used by which an information pattern of optically detectable

effects is formed by means of a radiation beam, the intensity of the radiation beam is an important parameter which largely dictates the quality of the information pattern. If the read/write head is a magnetic or magneto-optical write head which generates a magnetic field for the purpose of forming an information pattern in the form of magnetic effects (domains),

5 the field strength of the generated magnetic field may be an important adjustment parameter. If the information patterns is formed by means of write pulses the pulse width may be an important adjustment parameter. It is to be noted that the above-mentioned adjustment parameters are only few examples of the large number of adjustment parameters which are possible. In this respect reference is made in particular to NL-A-9000150 (PHN 13.217), in

10 which the adjustment parameter is a reference value for the speed with which the effects are formed at the adjusted reference value.

For determining the optimum setting of the driver circuit 98 the device comprises an analysis circuit 910, which derives from the read signal an analysis signal V_a which is indicative of the quality of the information pattern being read. The optimum setting

15 can be determined in a calibration procedure by forming test information patters for different settings of the driver circuit on the record carrier 91 and by selecting on the basis of the analysis signal V_a that setting for which the analysis signal indicates an optimum quality. In principle, the information signal V_i may be employed for writing the test information pattern. However, it is also possible to employ a test signal generator 911 for this purpose, which

20 may then be included, for example, in the signal processing circuit 97. The optimum setting is determined under control of the control unit 915, which for this purpose is coupled to the analysis circuit 910, to the driver circuit 98, and to the test signal generator 911, if present, which control unit is loaded with a suitable program or comprises a suitable hardware circuit. Preferably, the optimum setting is determined in a calibration procedure, which is

25 carried out after a record carrier has been inserted in the information recording device.

Further the information recording device has a digital input 96D for receiving digital signals D_i in accordance with international Standards or de-facto standards, such as CD-Audio Signals, CD-ROM signals etc. This input 96D is connected directly to the input of driver circuit 98, because the digital signals are alike to the digital recording signal

30 V_{op} generated by the processing circuit 97.

The digital input signal D_i is further read by reading means 97A, which read the address labels either from the digital main-stream data or from the subcode data and provides the same to the detection means 97B. Upon detection by the detection means 97B of an address label having a zero address value in succession of an address label having a non-

zero address value the detection means 97B trigger abortion means 97C, which aborts recording of the digital input signals Di by setting the driver circuit 98 into a non-operative condition. Preferably the means 97A, 97B and 97C and the driver circuit 98 are integrated in a single integrated circuit.

- 5 The playback apparatus according to the invention is arranged for retrieving the digital data from the optical disc as described with Figure 4. Before the user actually is given access to the digital data, a verification process is executed. The presence of at least one of the address labels having said different address value is verified, e.g. by reading the sector of which the address label is known to be different. If the reading response shows an error, the
- 10 presence of the different address value is detected, and if the response shows a normal sector, the different address value is absent. The value of the address label may also be verified directly by reading means arranged for reading the address label, such as described above with Figure 9. In dependence upon the verification the playback of the digital data is aborted, i.e. in the case that one or more of the different address values are absent. Illegal copies of
- 15 the optical disc may comprise some or all digital data of the sectors having the normal, increasing address values. However the illegal copies will not have the sectors having address labels with said different address values, as such labels cannot be recorded using standard recording equipment. The verification may be a build in verification procedure in the playback apparatus, e.g. verifying some sectors with fixed addresses. Alternatively, the
- 20 addresses of sectors to be verified may be stored on the optical disc in a normally readable sector. However in a preferred embodiment of the playback apparatus, the verification procedure is part of the digital data stored on the optical disc and is loaded from the optical disc in a programmable part of the playback apparatus when the optical disc is entered in the apparatus. For an optical disc comprising computer software, e.g. a CD-ROM, the
- 25 verification procedure preferably is an integral part of the computer software the user will activate.

- In a further embodiment of the optically readable disc at least one sector is provided with other errors instead of or in addition to said different address value. In a CD the channel code EFM is used as described above with Figure 4. The errors may be effected
- 30 by modifying the EFM channel bit patterns into non permitted patterns of channel bits or by violating other modulation or error correction rules. For example for EFM a minimum (d) and maximum (k) number of channel bit periods between each transition of logical value is given, the so called d,k constraint. If the d,k constraint is violated, the EFM decoder certainly will report errors. A reading device will produce an read error message when

reading such a sector having errors, and a standard recording device cannot record such errors. In a preferred embodiment the sectors comprising other errors are arranged adjoining sectors having only the different address value, as it will be difficult to detect which are the sectors having the different address values and which are the sectors comprising the other

- 5 errors, as the reading will be influenced by the combined effects of the adjoining sectors.

A malicious party faces various difficulties in creating an operative illegal copy. The playback apparatus is not able to read the sectors having said different address values and/or the sectors comprising the other errors, and will generate read errors. A recording apparatus may be forced by the malicious party to replace such sectors by dummy sectors.

- 10 However a standard recording apparatus cannot create the different address values or the other errors, while in operation the absence thereof will be detected on the playback apparatus. Modifying the standard recording device to create said different address values is difficult. Modifying the standard recording device even further to create the other errors is even more difficult. Therefore in practical circumstances an operative copy cannot be made.

CLAIMS:

1. An optically readable disc comprising digital data being arranged in sectors corresponding to a unit of organisation of the digital data and each sector being accessible via an address label stored with said sector, characterized in that the address label has an address value increasing with each successive sector except for at least one address label, which has a address value different from the increasing address value.
5. 2. An optically readable disc as claimed in claim 1, wherein the digital data comprises digital mainstream data and digital subcode data, characterized in that the address label having said different address value is stored in the digital subcode data.
3. 10. An optically readable disc as claimed in claim 1 or 2, characterized in that the address label having said different address value is stored with a sector containing informationless data.
4. 15. An optically readable disc as claimed in claim 1 or 2, characterized in that said different address value is a zero address value.
5. 20. An optically readable disc as claimed in claim 1, characterized in that a multiple of successive address labels have said different address value.
6. 25. An optically readable disc as claimed in claim 1, wherein the sectors are arranged in a program area starting with a pregap comprising sectors with informationless data, characterized in that at least one address label having said different address value is arranged in the pregap.
7. 30. An optically readable disc as claimed in claim 1, wherein the sectors are arranged in a program area preceded by lead-in area and succeeded by a lead-out area, characterized in at least one address label having said different address value is arranged in the lead-in area and/or the lead-out area.
8. 35. An optically readable disc as claimed in claim 1, characterized in that at least one address label which has said different address value is arranged preceding or succeeding a sector storing copy-protectable information
9. 40. An optically readable disc as claimed in claim 1, on which the digital data is stored according to predetermined modulation and error correction rules, characterized in that at least one sector comprises at least one error effected by violating the predetermined

modulation and error correction rules.

10. An optical disc recording apparatus for recording digital data on an optically readable disc, the digital data being arranged in sectors and each sector being addressable via an address label, which address label has an address value increasing with each successive sector, characterized in that the optical disc recording device comprises reading means for reading address labels, detection means for detection of an address label, which has a address value different from the increasing address value relative to the address value of the preceding address label, and abortion means for aborting the recording of digital data upon detection of said address label, which has said different address value.
- 10 11. An optical disc playback apparatus for retrieving digital data from an optically readable disc, the digital data being arranged in sectors and each sector being addressable via an address label, characterized in that the optical disc playback device comprises verification means for verifying an address label, which has an address value different from the address value increasing relative to the address value of the preceding address label, and abortion means for aborting the playback of digital data in dependence upon the verification.

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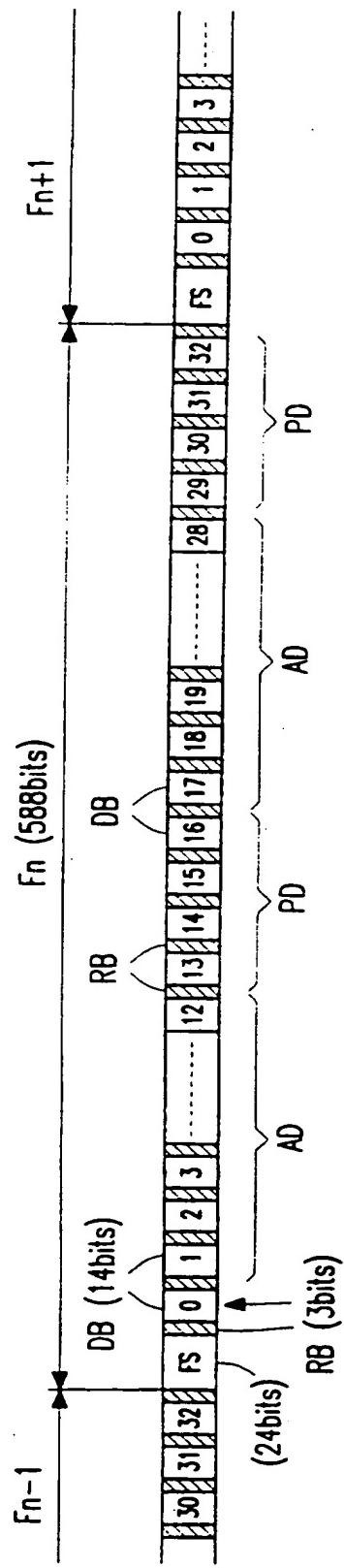


FIG. 1

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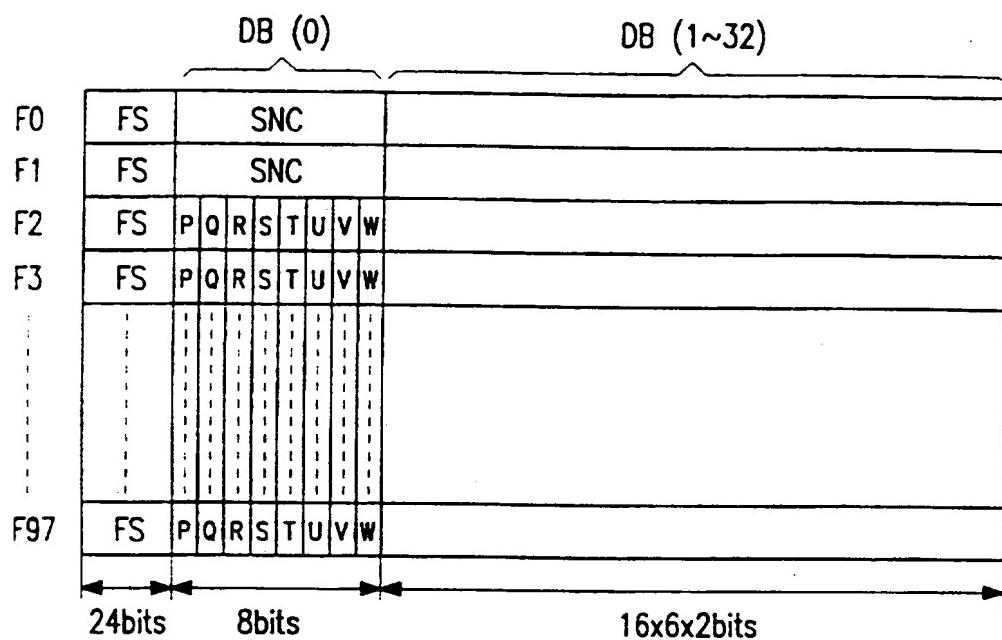


FIG. 2

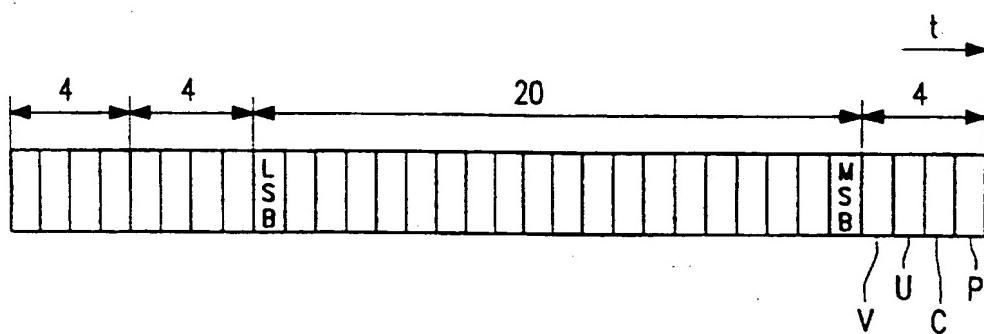


FIG. 5

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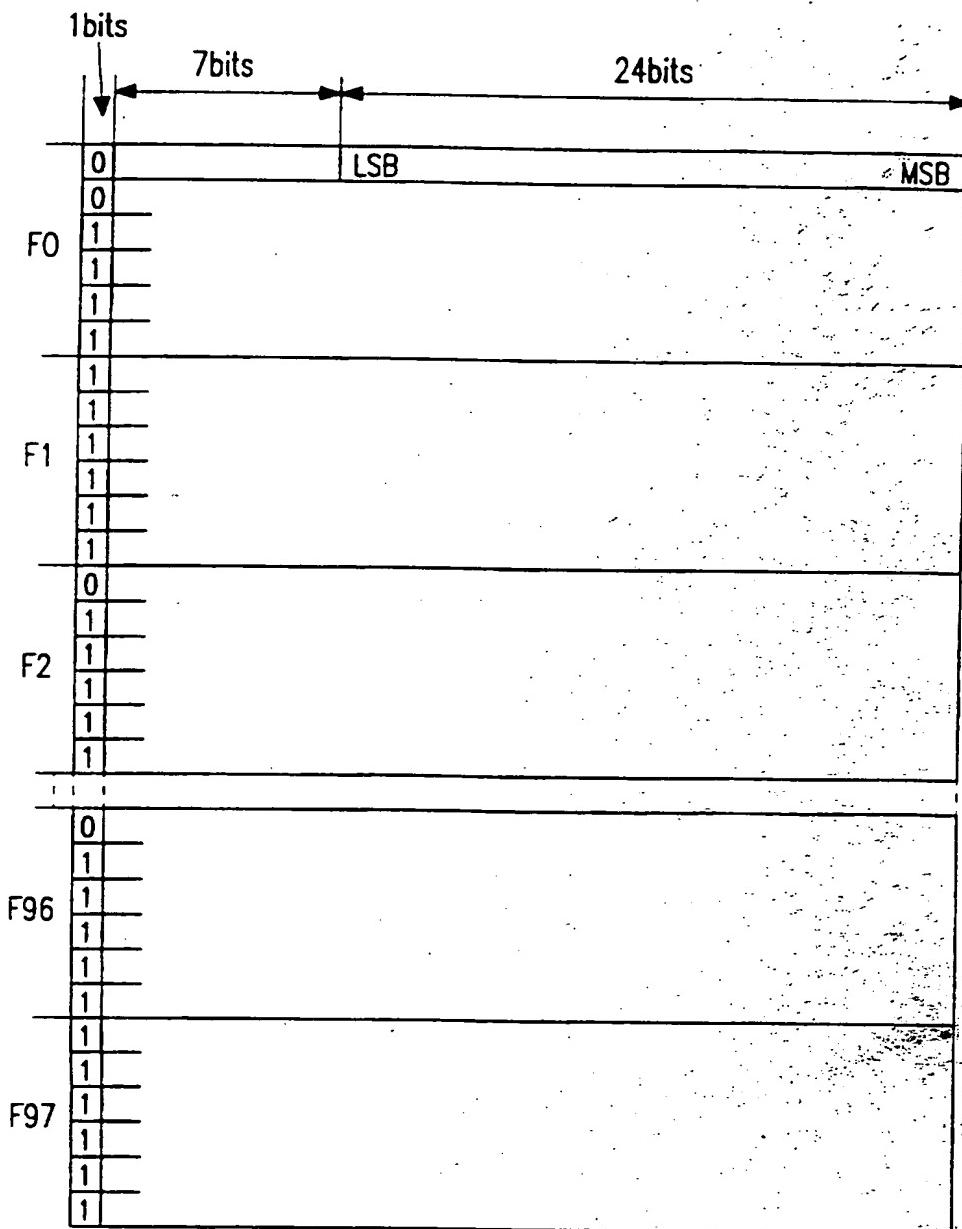


FIG. 3

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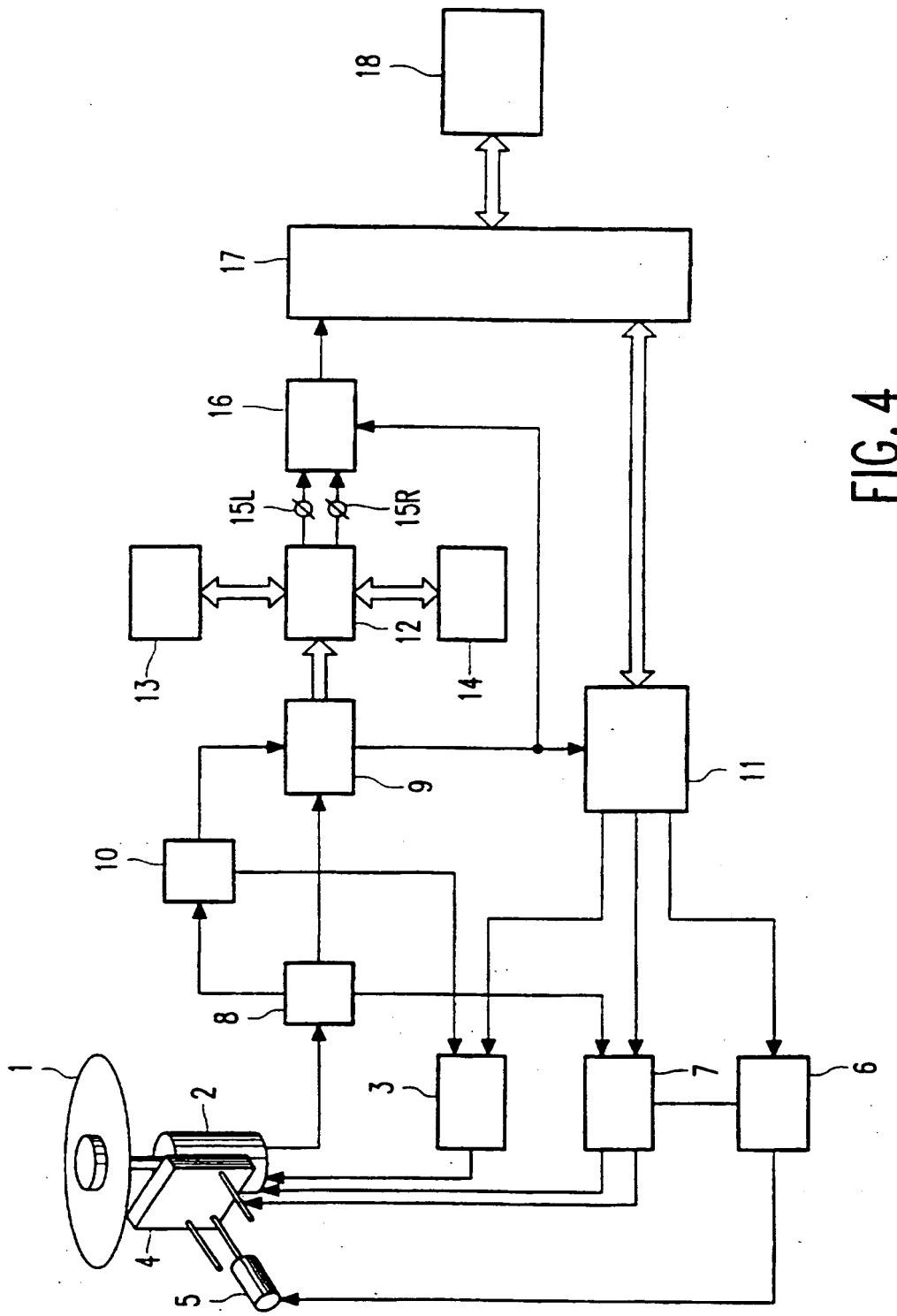
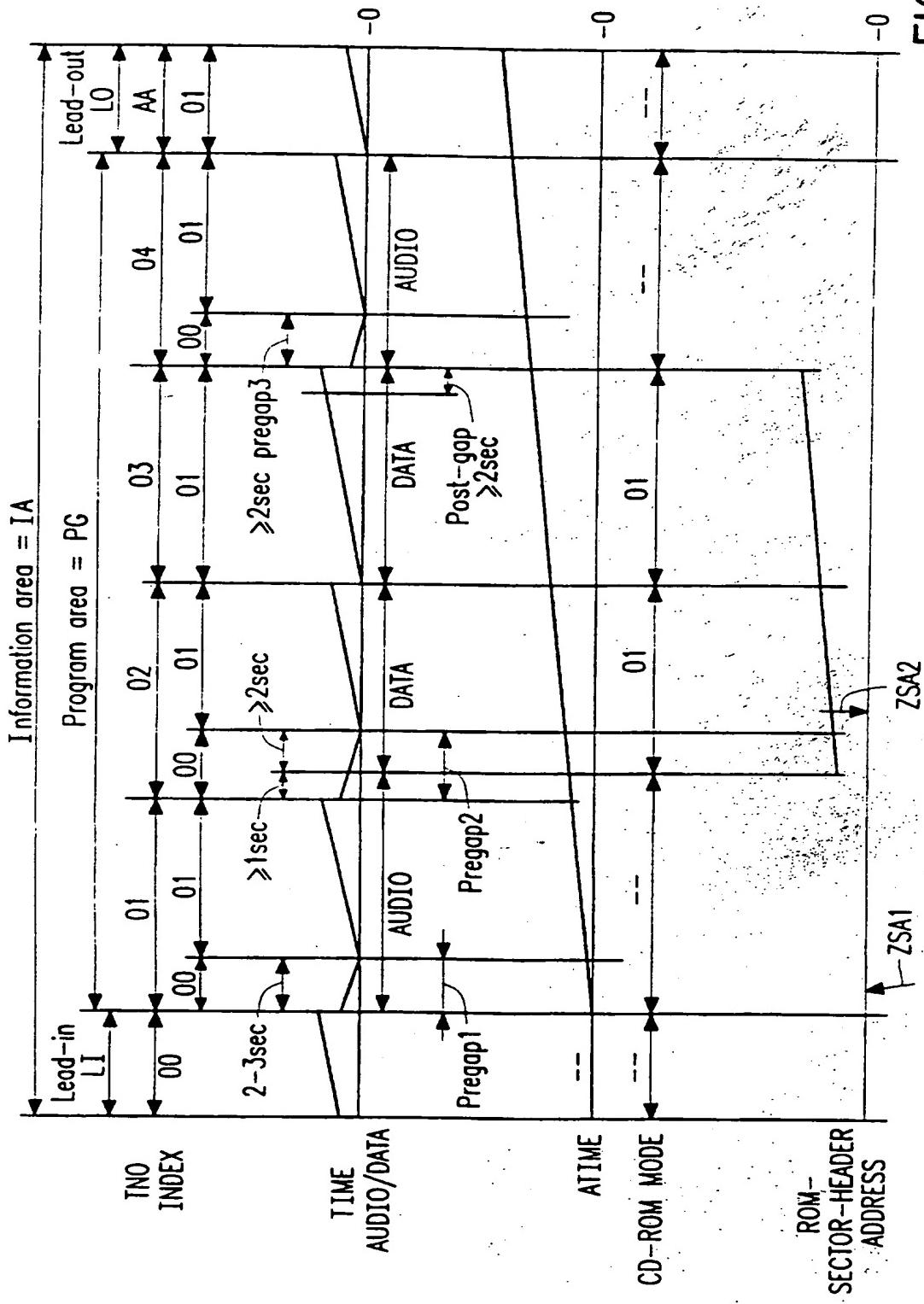


FIG. 4

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FIG. 6



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Layout of copy-protected CD-ROM

Address	Sector	Track	Index	Content	Comments
00:00:00		1	0	Zeros	Start of 150 sectors Pregap
00:00:01		1	0	Zeros	
00:00:02		1	0	Zeros	
-----		1	0	Zeros	=
00:00:74		1	0	Zeros	
00:01:00		1	0	Zeros	
00:01:01		1	0	Zeros	
00:01:02		1	0	Zeros	
-----		1	0	Zeros	=
00:01:73		1	0	Zeros	
00:01:74		1	0	Zeros	
00:02:00	0	1	1	Zeros	First readable sector on CD-ROM
00:02:01	1	1	1	Zeros	
00:02:02	2	1	1	Zeros	
-----		1	0	Zeros	=
00:02:15	15	1	1	Zeros	
00:02:16	16	1	1	PVD	Primary Volume Descriptor
00:02:17	17	1	1	PVD	Primary Volume Descriptor
00:02:18	18	1	1	Zeros	No reference to these sectors
-----		1	0	Zeros	= in the directory of the CD-ROM
00:02:24	24	1	1	Zeros	
00:02:25	25	1	1	Zeros	
00:02:26	26	1	1	Zeros	
00:00:00	27	1	1	Zeros	Address 00:02:27 missing
00:00:00	28	1	1	Zeros	Address 00:02:28 missing
00:00:00	29	1	1	Zeros	Address 00:02:29 missing
00:02:30	30	1	1	Zeros	
00:02:31	31	1	1	Zeros	
00:02:32	32	1	1	Zeros	
-----		1	0	Zeros	=
00:02:73	73	1	1	Zeros	No reference to these sectors
00:02:74	74	1	1	Zeros	in the directory of the CD-ROM
00:03:00	75	1	1	Data	User data
00:03:01	76	1	1	Data	User data
00:03:02	77	1	1	Data	User data
00:03:03	78	1	1	Data	User data
-----		1	1	Data	= User data
78:59:73	355348	1	1	Data	User data
78:59:74	355349	1	1	Data	User data
79:00:00	355350	1	1	Zeros	Postgap
-----		1	1	Zeros	= Postgap
79:01:74	355499	1	1	Zeros	Postgap
79:02:00	355500	AA		Zeros	Start Leadout, End of CD

ADD ↑ SN ↑ TNO ↑ INDEX ↑

FIG. 7

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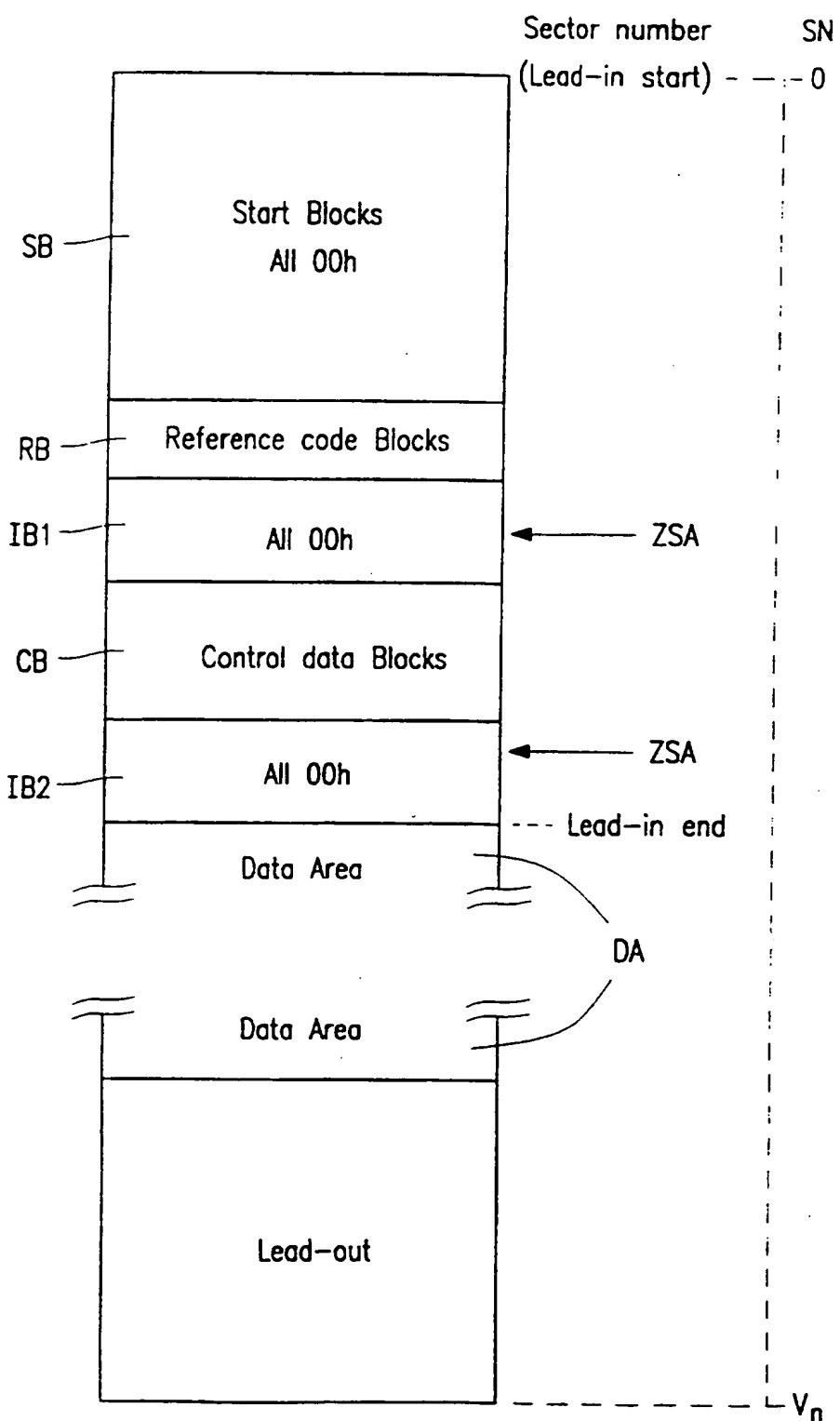


FIG. 8

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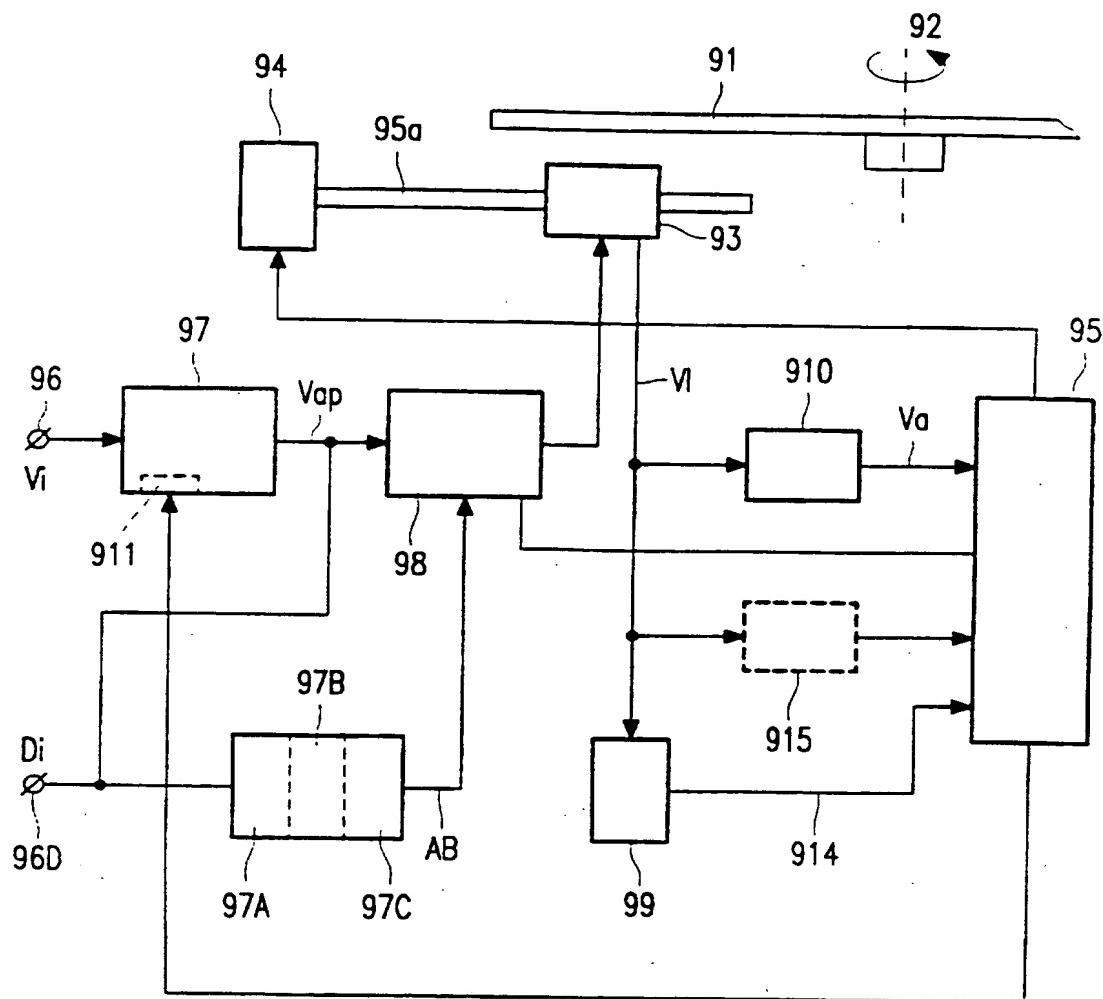


FIG. 9

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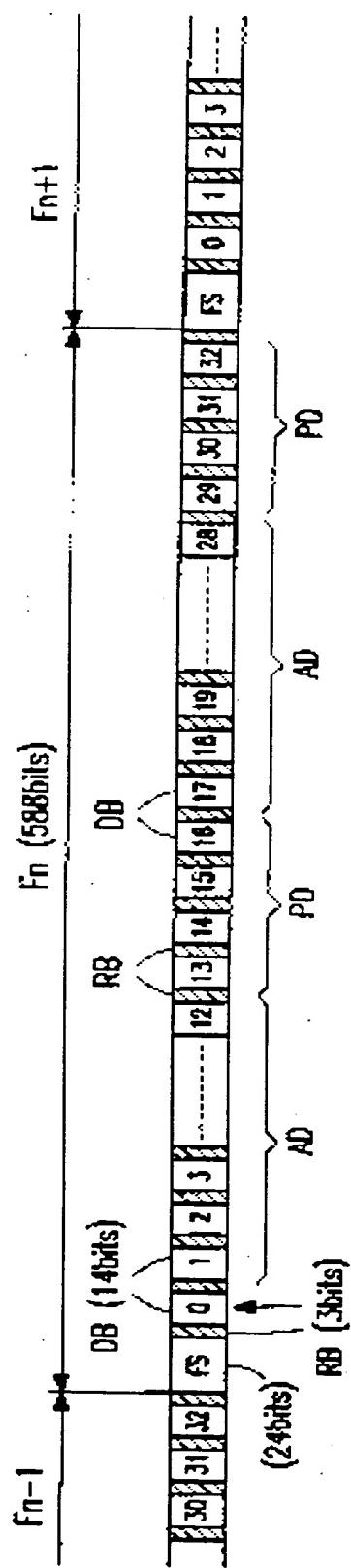


FIG. 1

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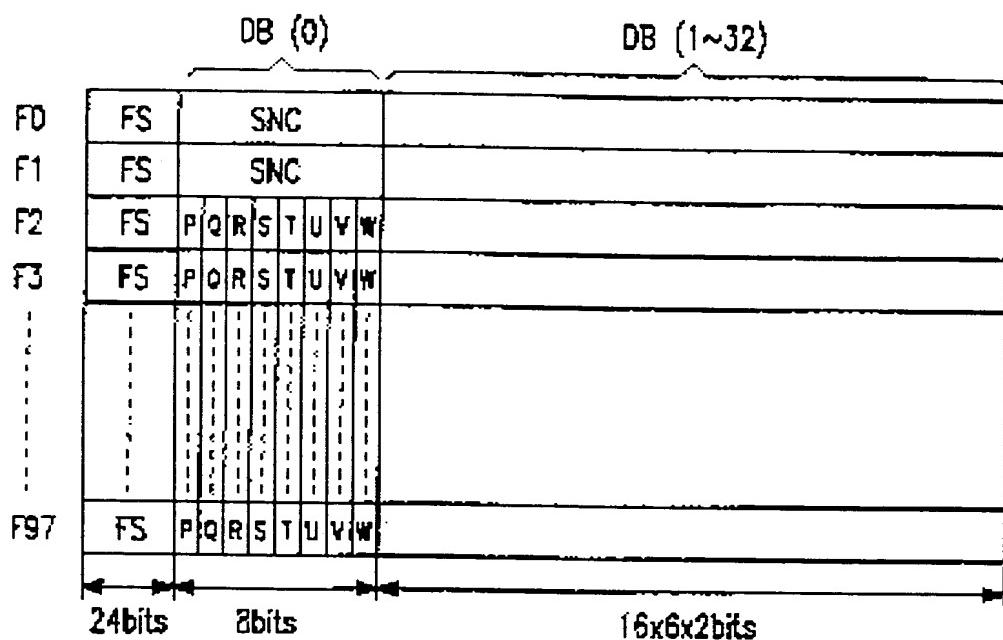


FIG. 2

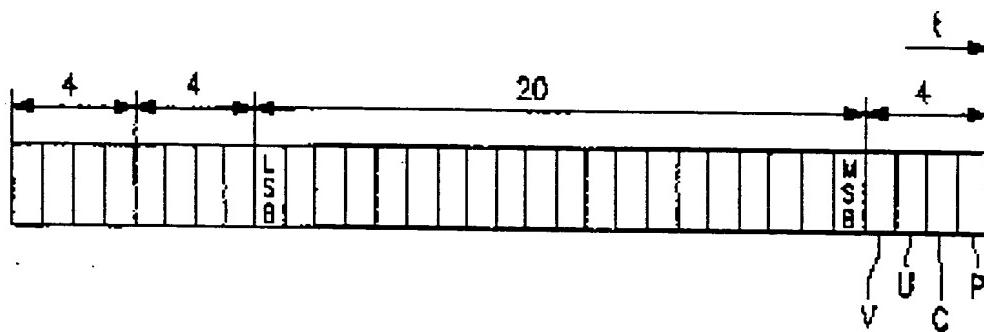


FIG. 5

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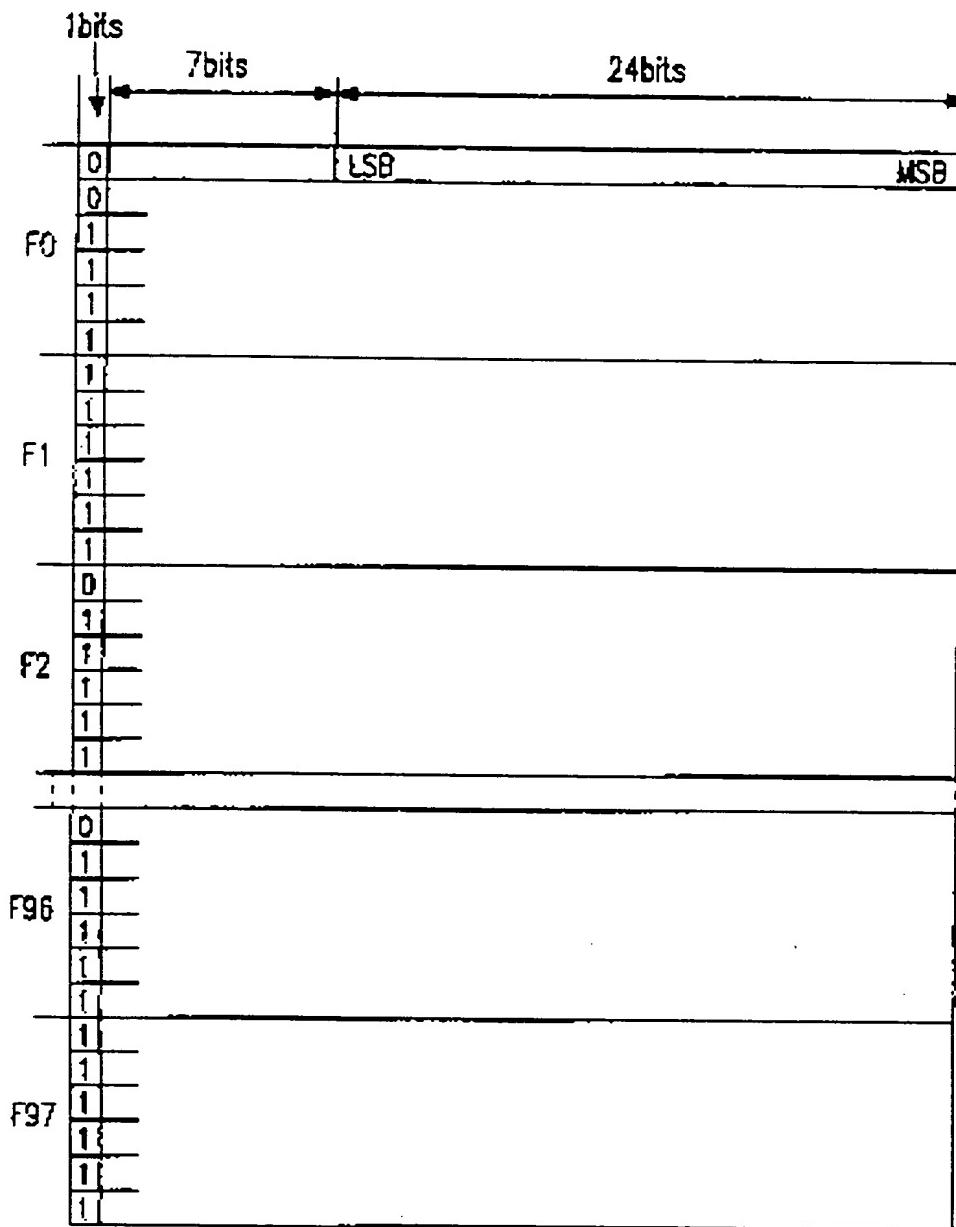
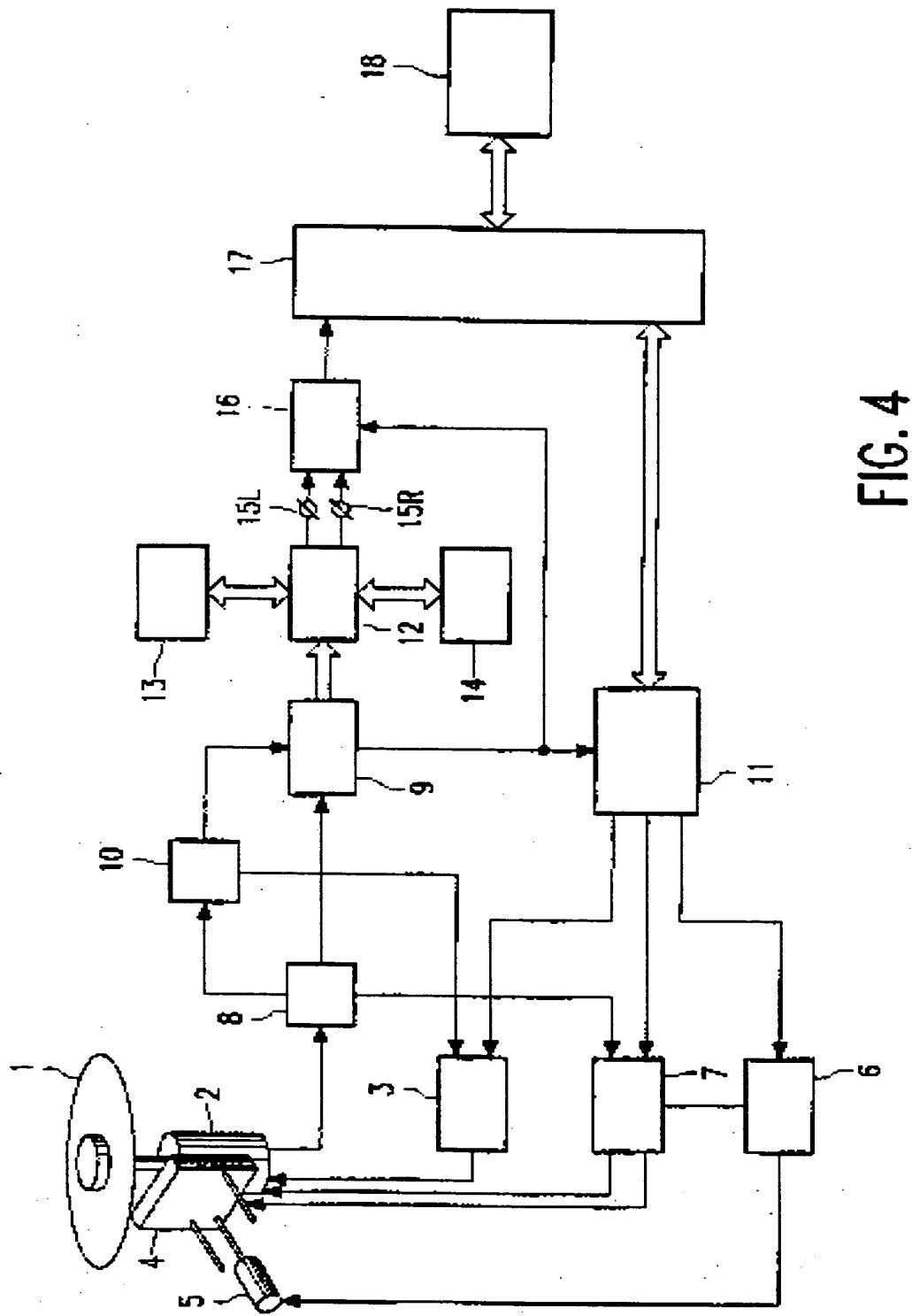


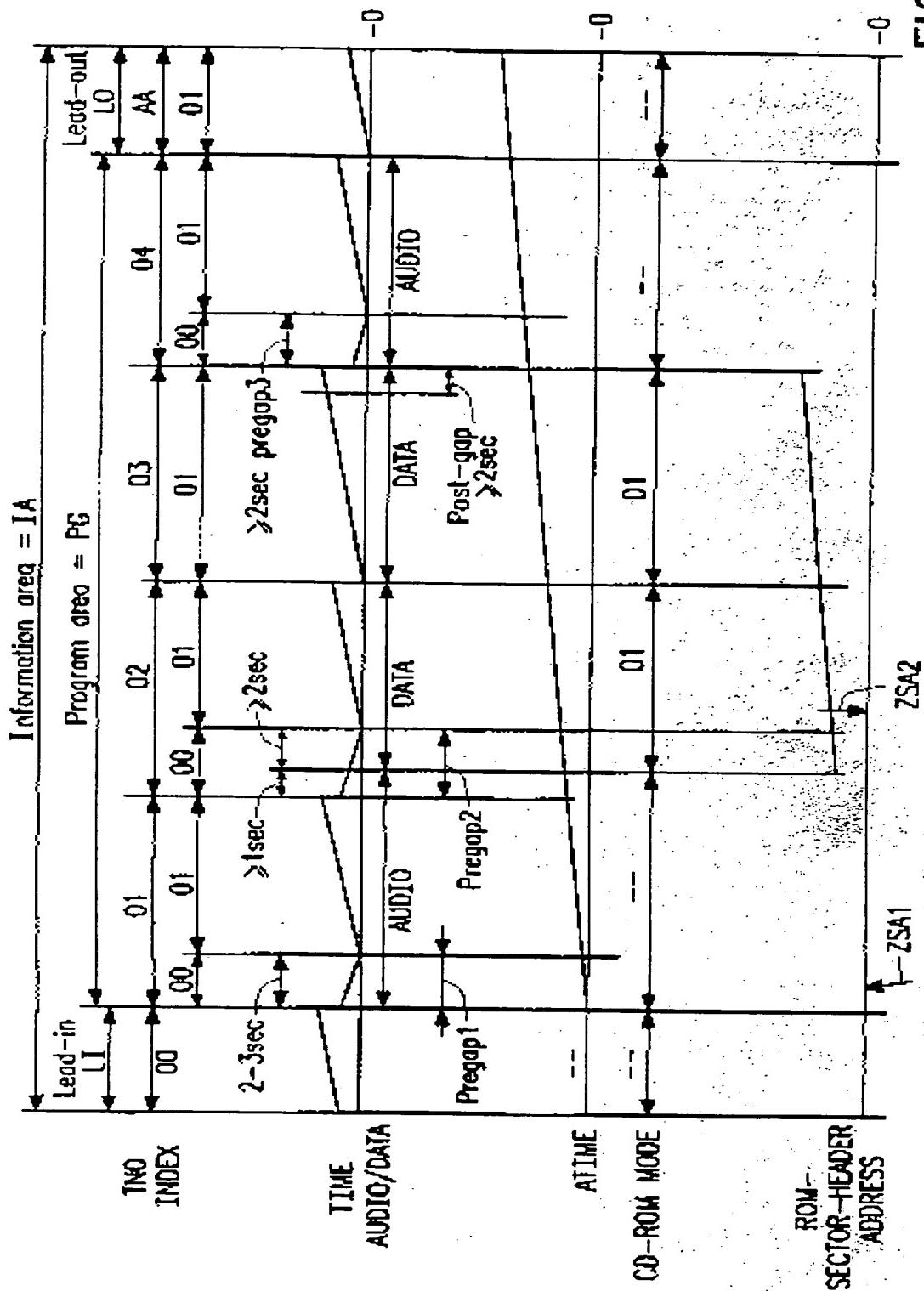
FIG. 3

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FIG. 6



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Layout of copy-protected CD-ROM

Address	Sector	Track	Index	Content	Comments
00:00:00		1	0	Zeros	Start of 150 sectors Pregap
00:00:01		1	0	Zeros	
00:00:02		1	0	Zeros	
-----		1	0	Zeros	=
00:00:74		1	0	Zeros	
00:01:00		1	0	Zeros	
00:01:01		1	0	Zeros	
00:01:02		1	0	Zeros	
-----		1	0	Zeros	=
00:01:73		1	0	Zeros	
00:01:74		1	0	Zeros	
00:02:00	0	1	1	Zeros	First readable sector on CD-ROM
00:02:01	1	1	1	Zeros	
00:02:02	2	1	F	Zeros	
-----		1	0	Zeros	=
00:02:15	15	1	1	Zeros	
00:02:16	16	1	1	PVO	Primary Volume Descriptor
00:02:17	17	1	1	PVO	Primary Volume Descriptor
00:02:18	18	1	1	Zeros	No reference to these sectors
-----		1	0	Zeros	= In the directory of the CD-ROM
00:02:24	24	1	1	Zeros	
00:02:25	25	1	1	Zeros	
00:02:26	26	1	1	Zeros	
00:03:00	27	1	1	Zeros	Address 00:02:27 missing
00:03:00	28	1	1	Zeros	Address 00:02:28 missing
00:03:00	29	1	1	Zeros	Address 00:02:29 missing
00:02:30	30	1	1	Zeros	
00:02:31	31	1	1	Zeros	
00:02:32	32	1	1	Zeros	
-----		1	0	Zeros	=
00:02:73	73	1	1	Zeros	No reference to these sectors
00:02:74	74	1	1	Zeros	In the directory of the CD-ROM
00:03:00	75	1	1	Data	User data
00:03:01	76	1	1	Data	User data
00:03:02	77	1	1	Data	User data
00:03:03	78	1	1	Data	User data
-----		1	1	Data	= User data
78:59:73	355348	1	1	Data	User data
78:59:74	355349	1	1	Data	User data
79:00:00	355350	1	1	Zeros	Postgap
-----		1	1	Zeros	= Postgap
79:01:74	355499	1	1	Zeros	Postgap
79:02:00	355500	AA		Zeros	Start Leadout, End of CD

ADD SN TNO INDEX

FIG. 7

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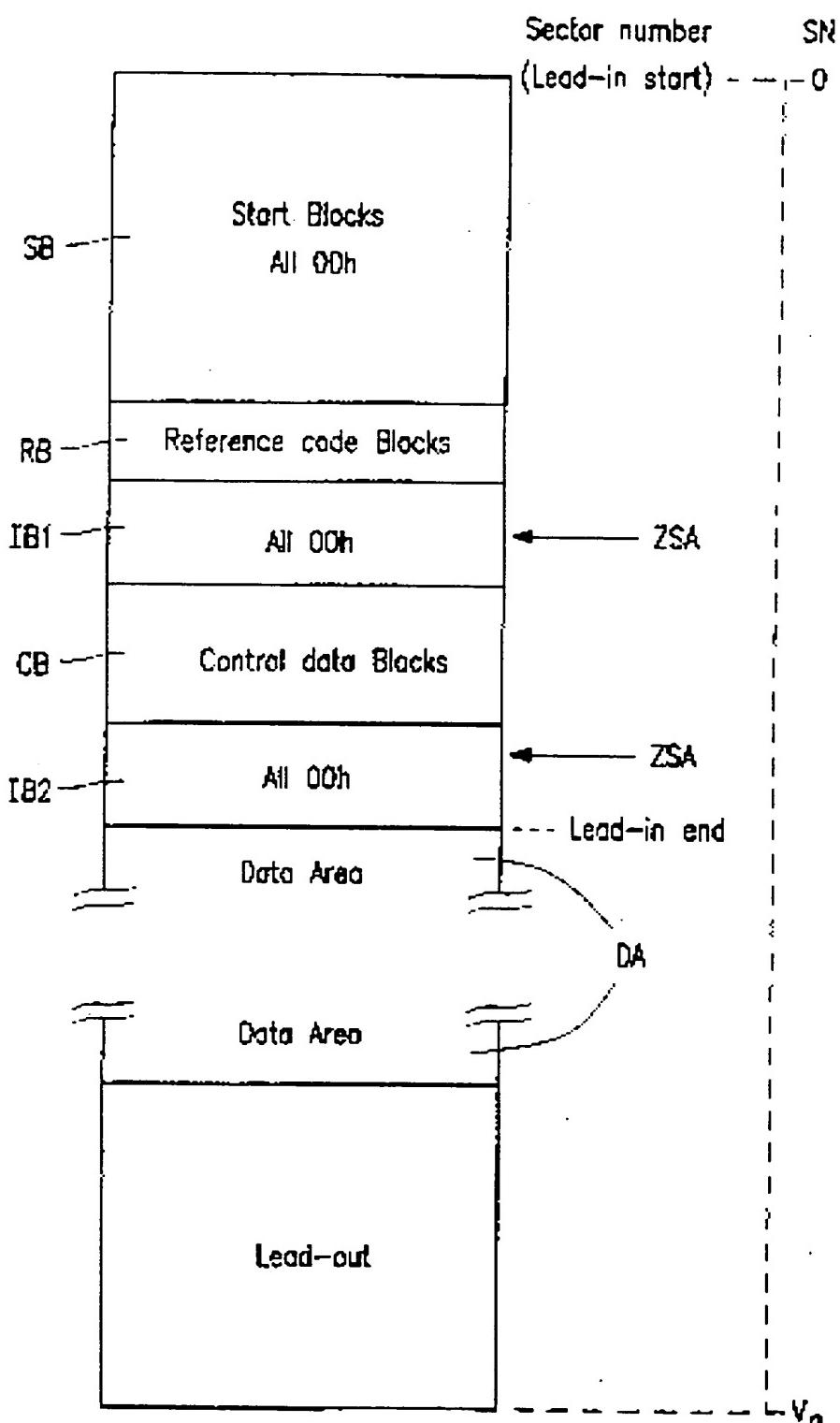


FIG. 8

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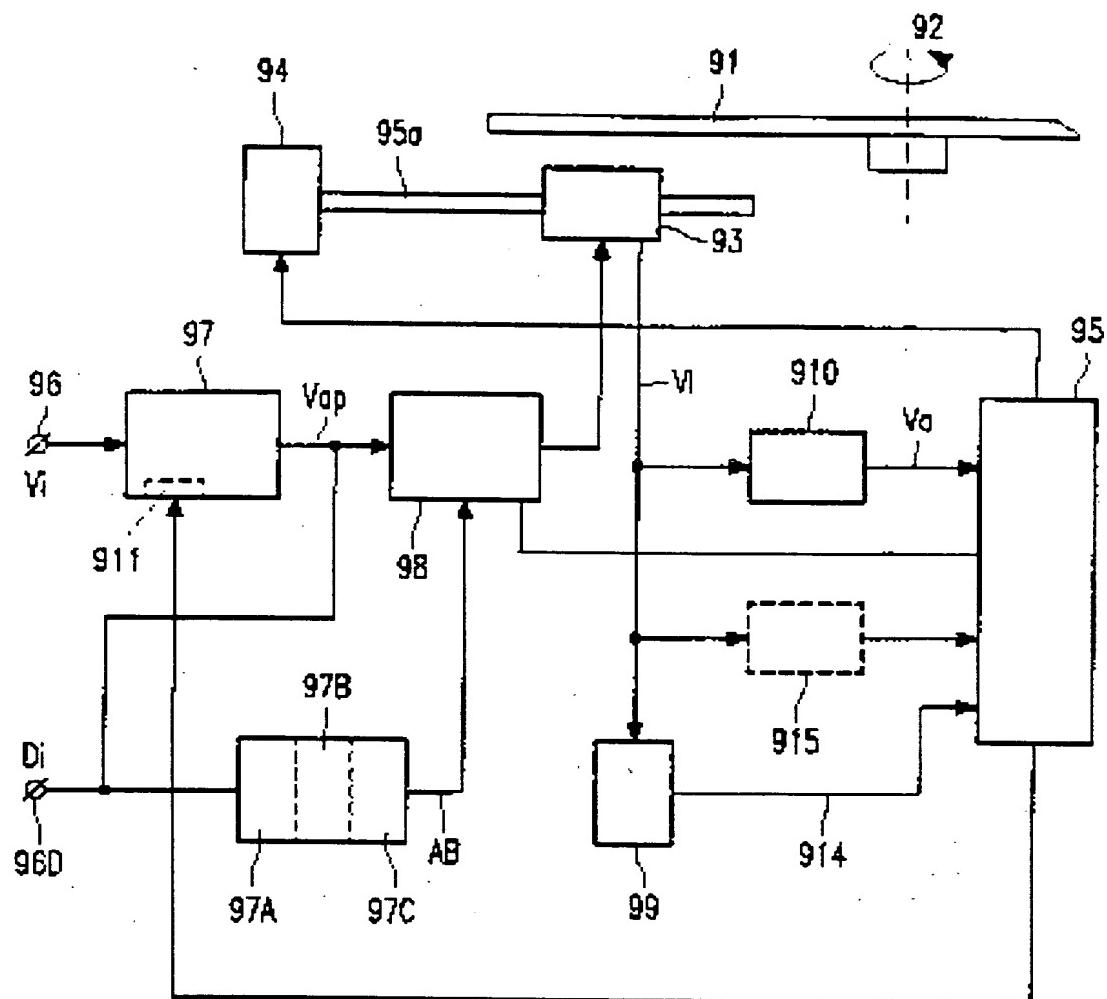


FIG. 9

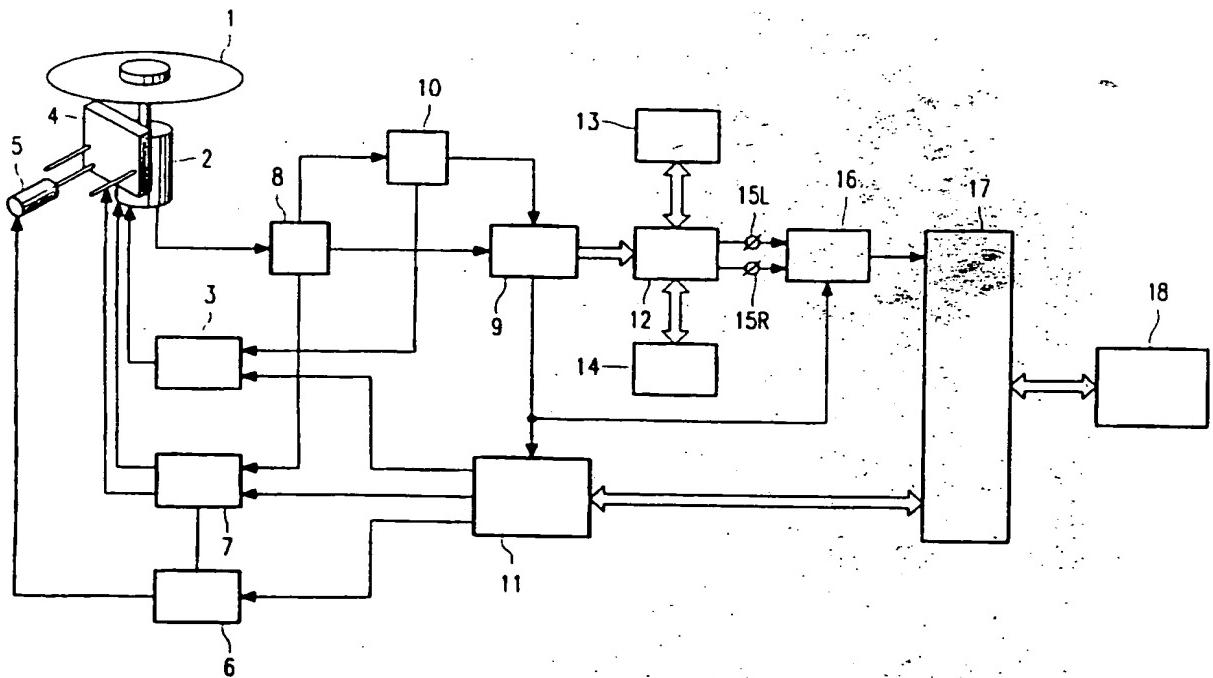


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ :		(11) International Publication Number:	WO 98/03973
G11B 7/007, 20/10, 27/28	A3	(43) International Publication Date:	29 January 1998 (29.01.98)

(21) International Application Number:	PCT/IB97/00867	(81) Designated States: CA, CN, JP, SG, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).
(22) International Filing Date:	14 July 1997 (14.07.97)	
(30) Priority Data:		Published
96202110.1 24 July 1996 (24.07.96)	EP	With international search report Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.
(34) Countries for which the regional or international application was filed:	NL et al.	
(71) Applicant: PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).		(88) Date of publication of the international search report: 19 March 1998 (19.03.98)
(71) Applicant (for SE only): PHILIPS NORDEN AB [SE/SE]; Kottbygatan 7, Kista, S-164 85 Stockholm (SE).		
(72) Inventors: SPITZENBEGER, Uwe; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). FAESSEN, Louis, Marie, Hubertus; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).		
(74) Agent: FAESSEN, Louis, M., H.; Internationaal Octrooibureau B.V., P.O. Box 220, NL-5600 AE Eindhoven (NL).		

(54) Title: IMPROVEMENTS IN AND RELATING TO OPTICALLY READABLE DISCS AND DISC RECORDING APPARATUS



(57) Abstract

An optical disc and an optical disc recording apparatus have been disclosed, which provide an improved protection against undesired or illegal copying. Information on optical discs is arranged in sectors, which each has an address label. The address value of the address labels increases linearly from the start of the disc or from the start of the program area of the disc. The address labels of specific sectors, which may have an informationless content, are given different, e.g. zero, address values, which prevent copying CD-ROM discs on a standard CD-Recorder apparatus. Said address labels may be stored in the main data stream or e.g. the subcode channel of a CD system.

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CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

INTERNATIONAL SEARCH REPORT

1

International application No.

PCT/IB 97/00867

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G11B 7/007, G11B 20/10, G11B 27/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G11B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPAT, WPI, JAPIO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0686968 A2 (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD), 13 December 1995 (13.12.95), column 19, line 30 - line 42; column 20, line 19 - column 21, line 16, abstract	1-2, 10-11
Y		3
A	--	4-9
X	EP 0674316 A2 (SONY CORPORATION), 27 Sept 1995 (27.09.95), page 5, line 57 - page 6, line 15; page 21, line 16 - line 53, abstract	1-2, 10
A	--	3-9, 11

 Further documents are listed in the continuation of Box C. See patent family annex.

- * Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "B" earlier document but published on or after the international filing date
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- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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- "&" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

27 January 1998

02 FEBRUARY 1998

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Benny Andersson
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB 97/00867

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Y		3
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Y	EP 0542730 A2 (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD), 19 May 1993 (19.05.93), column 9, line 40 - column 10, line 22, figure 7	3
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A	EP 0696799 A1 (SONY CORPORATION), 14 February 1996 (14.02.96)	1-11
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INTERNATIONAL SEARCH REPORT

Information on patent family members

07/01/98

International application No.

PCT/IB 97/00867

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International application No.

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